



Impact of Carbaryl on Blood Protein and Glucose Content of a Freshwater Fish *Heteropneustes fossilis*

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ABSTRACT

Carbaryl, a carbamate insecticide has been one of the most commonly and extensively used insecticide in recent years. It is moderately toxic to the aquatic animals. In this study experiments have been performed to see the toxicity of carbaryl at a sub-lethal concentration of 0.04 ppm on blood protein and glucose level of fish. Protein and glucose content in the blood of *Heteropneustes fossilis* exposed to sub-lethal concentration of carbaryl (0.04 ppm) for 7, 15 and 30 days, and blood protein was studied. A gradual decrease in protein and glucose content was observed during the experimental period.

INTRODUCTION

Environmental protection has attracted the attention of the wide cross section of people all over the world, which has now become a global issue amongst scientists and research workers in this area. Unfortunately, several toxic pollutants, few are even unknown, as unidentified to the biota are being regularly introduced in large quantities especially into the aquatic environment. Pollution of water is an important dimension of water and environmental degradation. The disposal of the industrial and agricultural wastes directly into the aquatic resources burdens the ecosystem and stresses the need to analyse the concentration of these substances in the medium as well as in organisms. Carbaryl, a synthetic 1-naphthyl-methyl carbamate insecticide is being used extensively due to its broad spectrum activity in commercial agriculture, poultry, pets, livestock, home and garden pest control. Humans are exposed either directly or indirectly to this pesticide causing various toxicities (Sittig 1985).

Pesticide pollution constitutes the most dangerous health hazard apart from creating adverse effects on fish production as the fishes are economically important non-target organisms. They are quite sensitive to a wide variety of toxicants and used as pollution indicators in the water quality management. In the present study an attempt has been made to analyse the toxicity of the carbaryl on the freshwater fish *Heteropneustes fossilis*.

MATERIALS AND METHODS

Heteropneustes fossilis is an edible fish having good commercial value. Healthy individuals were collected from the

nearby freshwater bodies, sterilized with KMnO_4 solution and acclimatized for 15 days in the laboratory conditions. The individuals were fed with commercial fish feed. LC-50 value of the species was determined.

Heteropneustes fossilis were divided into two groups; first group served as control and the other as experimental, which was subsequently exposed to a sub-lethal concentration of carbaryl (0.04 ppm) for a period of 30 days. The blood was collected and rinsed in 1% of saline solution to remove the adhering mucous and blood. The blood sample was weighted and homogenized in 0.85% KCl solution and protein content was estimated by the method suggested by Lowery et al. (1951). Glucose content was estimated by the anthrone method of Nicholas et al. (1956). Five fish from each group were selected randomly for the analysis of selected variables. It is static test and the data were analysed for statistical significance between the control and carbaryl treated fish by Student "t" test.

RESULTS AND DISCUSSION

Results clearly indicate (Table 1) that protein level in blood of *Heteropneustes fossilis* has changed to -51.98%, -68.56% and -77.47% over control during different periods. It was earlier observed that total serum protein in the blood of *Heteropneustes fossilis* exposed to different pesticides decreased in all the experimental fishes treated with insecticides. The decreased protein level was marked with the increase in exposure time. Sahai & Thakur (1994) reported changes in electrophoretic patterns in blood protein on exposure to pesticide in the hill stream fish *Garra gotyla*. Decrease in the level of serum protein in the present study is

Table 1. Effect of carbaryl (0.04 ppm) on protein content in blood of *H. fossilis*.

S. No.	Time (Days)	Amount of protein		% increase or decrease	“t” value	Probability
		Control	Treated			
1.	7 th day	0.0631±0.0118	0.0303±0.0028	-51.98%	2.6031	P<0.05
2.	15 th day	0.0773±0.0141	0.0243±0.0044	-68.56%	3.4415	P<0.01
3.	30 th day	0.0777±0.0218	0.0175±0.0044	-77.47%	2.3888	P<0.05

Value expressed as mg/100 mL blood, each value is the mean ± standard error of five individual observations.

Table 2. Effect of carbaryl (0.04 ppm) on glucose content in blood of *H. fossilis*.

S. No.	Time (Days)	Amount of glucose		% increase or decrease	“t” value	Probability
		Control	Treated			
1.	7 th day	102.8866±14.8070	66.7933±7.2023	-35.08%	1.9620	P<0.10
2.	15 th day	83.0666±11.4942	52.4166±7.3194	-36.89%	2.0132	P<0.10
3.	30 th day	83.5999±7.3893	27.44±4.0644	-67.17%	5.9606	P<0.001

Values expressed as mg/100 mL blood, each value is the mean ± standard error of five individual observations.

indicative of toxicity of carbaryl pesticide, which may alter the protein concentration through impairing the synthesis of DNA, RNA and by altering the activity of lysosomal enzymes. Eraslan et al. (2009) investigated the effect of carbaryl on some biochemical changes in rats and observed decline in the total protein content in the blood. Lin et al. (2007) examined the sub-lethal dose of carbaryl in blood protein of Zebra fish (*Danio rario*) embryos. Verma & Panigrahi (1998) administered the lethal and sub-lethal dose of agrofan on blood protein of *Oreochromis mossambicus*. The protein level of the exposed blood, declined significantly. Present investigations are parallel in line with these authors.

The glucose level (Table 2) was significantly decreased -35.80%, -36.89% and -67.17% in the blood of *Heteropneustes fossilis* over control. Agrawal (1992) noticed that the mercuric chloride declined blood glucose of *Channa punctatus*. Ghosh & Shrotri (1992) reported decrease of glucose in serum of *Scylla seratta* after exposure to thiodon. Singh et al. (1993) noticed the hypoglycemic condition in aldrin treated *Heteropneustes fossilis*, which is probably due to the rapid utilization of blood glucose during hyper excitability. Shrivastava & Singh (1995) investigated the effect of carbamate on *Heteropneustes fossilis* and found significant decrease in blood sugar level along with hypocholesteremia and hypochloresmia. The hypoglycemic condition in this study may be due to increased muscular activity of the fish, which requires more oxygen to meet the energy demand and consequently more amount of blood glucose rapidly utilized. Probably, fish try to meet this condition by increasing respiratory rate by drawing more amount of oxygen from contaminated water. This may be the reason

why low amount of blood glucose level was observed in treated fishes.

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